UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/696,081	10/29/2003	Sharon Liu	GP-302997	5946

7590 01/26/2007	**EXAMINER**
CHRISTOPHER DEVRIES	SILVER, DAVID
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Legal Staff, Mail Code 482-C23-B21	**ART UNIT** / **PAPER NUMBER**
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SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	01/26/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

PTOL-90A (Rev. 10/06)

	Application No.	Applicant(s)
Office Action Summary	10/696,081	LIU ET AL.
	Examiner	Art Unit	
	David Silver	2128	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on <u>26 October 2006</u>.

2a) ☒ This action is **FINAL**.   2b) ☐ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) <u>22-27 and 29</u> is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) <u>22-27 and 29</u> is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☒ The drawing(s) filed on <u>26 October 2006</u> is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a) ☐ All   b) ☐ Some * c) ☐ None of:

        1. ☐ Certified copies of the priority documents have been received.

        2. ☐ Certified copies of the priority documents have been received in Application No. _____.

        3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
    Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

1. Claims 1-29 were originally presented for examination.

2. Claims 1-29 were rejected.

3. Claims 1-21, 28 were cancelled and therefore withdrawn from consideration.

4. Claims 22-27; 29 are currently pending in Instant Application.

5. The Instant Application is not currently in condition for allowance.

Priority

6. Claimed priority has been acknowledged in previous Office Action (03/13/03).

Information Disclosure Statement

7. Applicants have not submitted an IDS.

8. It is noted that a search by the Office revealed numerous documents that were authored and published by at least one of the Named Inventors, and in instances by all Named Inventors. These documents appear to be related directly to the subject matter Applicants regard as their own.

9. Applicants also appear to reference unknown sources of information on paragraph 3 of the Specification, which were not submitted to the Office for consideration.

10. Applicants are respectfully reminded of their duty to disclose. A 37 CFR 1.105 Requirement for Information is not currently being made.

Response to Arguments

Response: Objection to Drawings

11. The drawings were received on 10/26/06. These drawings are acceptable.

12. Objections have been withdrawn in view of amended figures.

Response: Objection to Abstract

13. Objection to Abstract has been withdrawn in view of amendments.

Response: 35 USC 112

14. The 35 USC 112 second paragraph rejections have been withdrawn in view of cancellation of claims or Applicants remarks presented on page 8 section "Rejections Under 46 USC 112, First and Second

Paragraph".

Response: 35 USC 102 rejections of claims 1-8 10 12-20

15. Applicants are thanked for notifying the Office of a minor oversight in the enumerating of the

rejected claims under 35 USC 102. Applicants' statements on page 8 last paragraph to page 9 first

paragraph are correct.

Response: 35 USC 103

16. **Applicants argue:**

16.1   Bewley is directed to the use of adjoint analyses for fluid flow simulation
applications, which are wholly disparate from automobile powertrain systems.

(Remarks: page 9, 2nd paragraph from bottom)

16.2   Here, it is submitted that one of skill in the art looking to determine unknown model
parameters of a non-linear dynamic system model of an automobile powertrain system
would not look to the methodology disclosed in Bewley, namely because this disclosure is
directed to fluid flow simulation applications. As noted above, fluid flow simulation
applications are wholly disparate from automobile powertrain systems, and the person of
ordinary skill in the automobile powertrain system art would not look to the teachings
associated with fluid flow simulation applications to determine unknown model parameters
of a non-linear dynamic automobile powertrain system model.

(Remarks: page 10, paragraph 3)

17. **Examiner Response:**

17.1   Regarding subsections 1 and 2 *supra*, Applicants are arguing non-analogous art. Specifically,

Applicants state "one of skill in the art looking to determine unknown model parameters of a non-

linear dynamic system model of an automobile powertrain system would not look to the methodology

disclosed by Bewley, namely because this disclosure is directed to fluid flow simulation application."

(Remarks: page 10 para 3).

Respectfully, this statement is not agreed-with. Specifically, the powertrain system contains dynamic

components which, in this instance are modeled through the use of fluid flow. Fluid flow simulation

is the simulation of dynamic components in a "fluid-like" / dynamic manner. For example, fluid flow

simulation and modeling is also used for circuit simulations.

> [0003] Controllers for systems and subsystems, such as engine powertrain systems and subsystems, are increasingly being implemented using modern control techniques. Modern control techniques are derived from mathematical models that mathematically describe the dynamic behavior of the system to be controlled. The mathematical model of such systems can be derived, for example, from one or more physical laws, or from experimental data using known regression techniques.

17.2   In fact, Applicants fully agree and find the above statements to be true, as evidenced by

paragraph 3 of the Background of the Specification, which is recited and emphasized above. Wherein

the physical laws and dynamic behaviors correlate to the correlate to the fluid-like dynamic

simulations.

17.3   Therefore, the rejections are maintained.

Claim Rejections - 35 USC § 102

> The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:
> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

18. Claim 22 is rejected under 35 U.S.C. 102(b) as being anticipated by Ilya Kolmanovsky's "Evaluation of

Turbocharger Power Assist System Using Optimal Control Techniques" ("Kolmanovsky").

Kolmanovsky discloses: 22. A method of identifying unknown model parameters of a non-linear dynamic

system model, the method comprising: determining a governing state equation for the powertrain system

(page 2 col 2 para 2); determining a cost function **(page 2 col 2 para 1 first sent)**; determining a

perturbation state equation from the governing state equation **(page 2 col 2 para 1)**; determining an

adjoint equation from the governing state equation **(page 5 col 1 para 2 sentence 2-3)**; determining

an adjoint identity from the governing state equation **(page 5 col 1 para 2 sentence 2-3)**;

determining a perturbation cost function based at least in part on the determined adjoint equation, the

determined perturbation station equation, and the determined adjoint identity **(page 2 col 2 para 1)**;

determining a gradient based at least in part on the determined adjoint equation **(page 5 col 1 para 2)**;

supplying the governing state equation, the adjoint equation, and the perturbation cost function to a

general purpose processor; and causing the general purpose processor to iteratively determine changes

in the perturbation cost function that result from incremental changes in arbitrarily chosen values of one

or more of the unknown parameters to thereby identify the unknown model parameters **(page 9 col 1**

middle to end of column).

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

19. Claims 22-27 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Thomas R.

Bewley's "Adjoint and Raccati: essential tools in the analysis and control of transitional and turbulent

flow systems" ("Bewley"), and further in view of Ilya Kolmanovsky's "Evaluation of Turbocharger

Power Assist System Using Optimal Control Techniques" ("Kolmanovsky").

Bewley discloses: 22. A method of identifying unknown model parameters of a non-linear dynamic

system model, the method comprising: determining a governing state equation for the powertrain system

(Slide 10, 5, 7); determining a cost function **(slide 17, 2, 5, 15)**; determining a perturbation state

equation from the governing state equation **(slide 5, 10, 18, 26)**; determining an adjoint equation from

the governing state equation **(slide 6, 7, 18)**; determining an adjoint identity from the governing state

equation **(slide 19 "adjoint identity", 6, 7, 18)**; determining a perturbation cost function based at

least in part on the determined adjoint equation, the determined perturbation station equation, and the

determined adjoint identity **(slide 18, 5, 10, 26)**; determining a gradient based at least in part on the

determined adjoint equation **(slide 2, 6, 10, 16)**; supplying the governing state equation, the adjoint

equation, and the perturbation cost function to a general purpose processor; and causing the general

purpose processor to iteratively determine changes in the perturbation cost function that result from

incremental changes in arbitrarily chosen values of one or more of the unknown parameters to thereby

identify the unknown model parameters **(slide 10, 21, 25 "centralized computer")**.

Bewley however does not appear to substantially disclose that the non-linear dynamic system model

includes one or more powertrain system models. Kolmanovsky discloses an analogous adjoint based

system modeling having the said feature **(page 2 col 2 para 2; page 2 col 2 section titled**

"Powertrain Model"). Bewley and Liu appear to be sponsored by GM Powertrain (Transmission Group)

(Bewley2 page 347 last paragraph). As such, it would appear that Bewley and Liu would have an interest

in developing a system that relates to GM's Powertrain Transmission Group. Furthermore, Bewley

provides motivation on (slide 28 "Extension to 2D base flows (e.g., cylinder, ...)", slide 29).

Bewley discloses: 23. The method of Claim 22, further comprising:

determining one or more initial states for solving the governing state equation **(slide 12 last**

line "initial conditions");

supplying one or more of the initial states to the general purpose processor; and causing the

general purpose processor to iteratively determine changes in the cost function that result from

incremental changes in one or more of the initial states **(slide 10, 25)**.

Bewley discloses: 24. The method of Claim 22, wherein: the adjoint equation includes one or more

adjoint states; and the incremental changes are driven by gradients derived from the adjoint states **(this**

is an inherent feature of adjoint equations; middle page 10).

Bewley discloses: 25. The method of Claim 22, wherein the changes in the cost function are iteratively

determined until a specified accuracy criterion is met **(slide 2 item 4 "convergence")**.

Bewley discloses: 26. The method of Claim 22, wherein the changes in the cost function are iteratively

determined until a predetermined number of iterations is completed **(slide 2 item 4 "convergence")**.

Bewley discloses: 27. The method of Claim 22, further comprising: determining the state equation, cost

function, adjoint equation, and gradient by supplying one or more exogenous inputs from powertrain

system measurements or controller generated signals **(slide 25 "sensor measurements, slide 6, 7,**

18).

Bewley discloses: 29. The method of Claim 22, further comprising: validating the non-linear dynamic

model using the identified model parameters against one or more sets of experimentally determined or

simulated data **(slide 10 "linearization changes at each iteration")**.

Conclusion

20. All claims are rejected.

21. The Instant Application is not currently in condition for allowance.

22. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David Silver whose telephone number is (571) 272-8634. The examiner can normally be reached on Monday thru Friday, 10am to 6:30pm. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kamini Shah can be reached on 571-272-2279. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

David Silver
Patent Examiner